

**ABSTRACT OF THE DISCLOSURE**

Methods and apparatus for controlling polyolefin reactor temperature. In one embodiment, a simulation model is constructed for improving control of polymerization temperature in a polyethylene loop slurry reactor. The model is used to design the reactor coolant system to capacity and to improve tuning of system controllers, such as the reactor temperature controller and coolant temperature controller. A coolant control valve is sized having a bilinear flow characteristic which improves Cv reproducibility at low coolant flow rates and thus improves reactor temperature control.